

LAW OFFICES
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC

2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, D.C. 20037-3202
TELEPHONE (202) 293-7060
FACSIMILE (202) 293-7860

CALIFORNIA OFFICE

1010 EL CAMINO REAL
MENLO PARK, CA 94025
TELEPHONE (650) 325-5800
FACSIMILE (650) 325-6606

October 8, 1999

JAPAN OFFICE

TOEI NISHI SHIMBASHI BLDG. 4F
13-5 NISHI SHIMBASHI 1-CHOME
MINATO-KU, TOKYO 105, JAPAN
TELEPHONE (03) 3503-3760
FACSIMILE (03) 3503-3756

BOX: PATENT APPLICATION

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: Application of Masayuki KATAGIRI
MOTOR
Our Reference: Q56143

Dear Sir:

Attached hereto is the application identified above including the specification, claims, executed Declaration and Power of Attorney, six (6) sheets of drawings, one (1) priority document, Preliminary Amendment, Information Disclosure Statement, PTO Form 1449 with reference, executed Assignment and PTO Form 1595.

The Government filing fee is calculated as follows:

Total Claims	13 - 20 =	0 x \$18 =	\$ 000.00
Independent Claims	2 - 3 =	0 x \$78 =	\$ 000.00
Base Filing Fee	(\$760.00)		\$ 760.00
Multiple Dep. Claim Fee	(\$260.00)		\$ 000.00
TOTAL FILING FEE			\$ 760.00
Recordation of Assignment Fee			\$ 40.00
TOTAL U.S. GOVERNMENT FEE			\$ 800.00

Checks for the statutory filing fee of \$ 760.00 and Assignment recordation fee of \$ 40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from:

Japanese Patent Application

P. Hei. 10-288292

Filing Date

October 9, 1998

Respectfully submitted,
SUGHRUE, MION, ZINN, MACPEAK & SEAS
Attorneys for Applicant(s)

By *Darryl Mexic*
Darryl Mexic
Registration No. 23,063

DM:clf

ATTN: BOX PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Masayuki KATAGIRI

Serial No.: NOT YET ASSIGNED

Filed: October 8, 1999

For: MOTOR

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Prior to examination of the above-identified application, please amend the above-mentioned application as

follows:

IN THE SPECIFICATION:

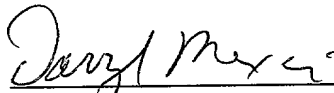
Page 4, line 10, delete "Fig. 7 is a side view" and insert therefor --Fig. 7 (a) - Fig. 7 (c) are side views--.

R E M A R K S

The above amendment is made to correct the designation of the Figures in the brief description of the drawings so that the brief description conforms correctly to the drawings.

Applicant submits no questions of new matter should arise and entry is requested.

Respectfully submitted,


Darryl Mexic
Registration No. 23,063

SUGHRUE, MION, ZINN, MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
Tel: (202) 293-7060
DM:clf

Date: October 8, 1999

MOTOR

BACKGROUND OF INVENTION

Field of the Invention

5 The present invention relates to a motor well adaptable for a CD-ROM driver, a DVD-ROM drive or others.

Related art

10 A brushless motor, disclosed in JP-A-8-331820, has been known for a motor used for the CD-ROM drive, for example. The brushless motor follows. A rotary shaft is supported with aid of a radial bearing as a sintered oil-impregnated bearing and a thrust plate within a cylindrical bearing housing. The radial bearing is located in the upper portion of the bearing housing. The inside diameter of the lower part of the bearing housing is larger than that of the upper part thereof. A dish-like thrust cap is mounted on the lower part of the bearing housing. A thrust plate is disposed between the lower end of the rotary shaft and the thrust cap.

15 The motor is capable of preventing bearing lubricating oil from flowing out of a thrust receiving portion since the dish-like thrust cap is mounted on the lower part of the bearing housing, and a thrust plate is disposed between the lower end of the rotary shaft and the thrust cap. In the radial bearing fixed to the bearing housing, the lubricating oil receives a pumping action with rotation of the shaft, and flows downwardly of the inner wall of the bearing housing. The oil thus flowing out reaches a portion

20

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where the thrust cap is attached to the bearing housing. Even if the thrust cap is attached in press fitting manner, a minute gap will possibly be formed between the cap and the housing since those members are separate members. If such a gap is present, oil will
5 leak through the gap outside the thrust cap.

When a disc is attached to the disc hub integral with the rotary shaft, a force is applied to the fixing portion for the thrust cap and the bearing housing in a direction in which the thrust cap is pulled out. As a result, the oil is likely to flow outside from
10 the fixing portion.

SUMMARY OF INVENTION

Accordingly, an object of the present invention is to provide a motor which is free from the flowing of bearing lubricant oil
15 outside the bearing housing, and has a long lifetime and a high reliability.

An aspect of the present invention, there is provided a motor comprising:

a cup-like bearing housing integrally including a cylindrical
20 portion, a bottom portion and a hollow portion defined by said cylindrical portion and said bottom;

a radial bearing held in said hollow portion while being in contact with the inner surface of said cylindrical portion;

a thrust receiving plate disposed at said bottom portion of
25 said cup-like bearing housing; and

a rotary shaft rotatably supported by said radial bearing in a state that an extreme end thereof is in contact with said thrust receiving plate.

In the present invention, the bearing housing, which is shaped like a cup, includes a cylindrical portion and a bottom portion closing one end of the cylindrical portion. Therefore, in the resultant motor, no bearing oil flows outside from the bottom portion of the bearing housing.

Shaping a metal sheet by drawing process forms the bearing housing. Therefore, the number of parts required is reduced. The unit form of the bearing housing eliminates the leakage of bearing oil out of the housing.

A gap, which may be utilized for an oil reservoir, is formed between the inner surface of the cylindrical portion of the bearing housing and the outer surface of the radial bearing. Provision of the gap prevents the bearing oil from leaking out of the bearing housing, elongates a lifetime of the motor, and allows bearing oil replenishment at the time of assembling the rotor into the structure.

20

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a cross sectional view showing a portion of a motor which constitutes a first embodiment of the present invention.

Fig. 2 is a cross sectional view showing a portion of another motor which constitutes a second embodiment of the present

invention.

Fig. 3 (a) and Fig. 3(b) are cross sectional views showing a bearing housing which may be used for the motor of the invention.

Fig. 4 is a perspective view showing a burring portion which
5 may be used for the motor of the invention.

Fig. 5 is a cross sectional view showing a way of assembling a bearing assembly, which may be used for the motor of the invention.

Fig. 6 is a cross sectional view showing a thrust bearing assembly which may be used for the motor of the invention.

Fig. 7 is a side view showing a way of assembling a stator
10 assembly which may be used for the motor of the invention.

Fig. 8 is a side view showing a way of assembling a rotor assembly which may be used for the motor of the invention.

15 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will be described with reference to the accompanying drawings. As shown in Fig. 1, a bearing housing 7 includes a cylindrical portion 21, a bottom portion 22 and a hollow portion 23. To form the bearing
20 housing 7, a metal sheet is pressed into a cup-like shape having the cylindrical portion 21 and the bottom portion 22 closing one end of the cylindrical portion 21. A thrust receiving plate 8 is placed on the bottom portion 22 within the hollow portion 23 of the bearing housing 7 while being centered. A radial bearing 9 is
25 disposed within the cylindrical portion 21 of the bearing housing

7 while being in contact with the inner surface (peripheral) of the cylindrical portion 21. A rotary shaft 1 is supported by the inner surface of the radial bearing 9 in a state that it is rotatable about its center axis. In this case, the rotary shaft 1 rotates in a state that an extreme end 24 of the rotary shaft 1 is in contact with the thrust receiving plate 8. In the present embodiment, the drawing process is used for shaping a metal sheet into the cup-like bearing housing 7 with the bottom portion 22. However, any other suitable process may be used for the same purpose, as a matter of course.

A hub 2 to which a disc is set is secured onto the upper end of the rotary shaft 1. A rotor case 3 is fastened to the under surface of the hub 2. A rotor magnet 4, cylindrically shaped, is fastened onto the inner surface of the rotor case 3. A stator core 5 is fit to the outer surface (peripheral) of the cylindrical portion 21 of the bearing housing 7, while being disposed facing the inner surface of the rotor magnet 4. The stator core 5 includes a plural number of protruding poles, which are radially extended and equiangularly disposed around the core. Each protruding pole has a drive coil 15 wound thereon. The rotor case 3, the hub 2 and the rotary shaft 1 are rotatable in unison.

The bearing housing 7 has a stepped part 26, which is located between its bottom portion 22 and an end face 28 of one end of the radial bearing 9. The inside diameter of an upper portion of the cylindrical portion 21 above the stepped part 26 is larger than

that of a lower portion of the cylindrical portion below the stepped part 26. The rotary shaft 1 includes a reduced-diameter portion 27, located between an extreme end 24 thereof closer to the thrust receiving plate 8 and an end face 28 of one end of the radial bearing

5 9. A washer 10 as ring-like slipping-off preventing means is placed between the stepped part 26 of the radial bearing 9 and the end face 28 of the radial bearing 9. The washer 10 engages the reduced-diameter portion 27 of the rotary shaft 1. Bringing the washer 10 into contact with the end face 28 of the radial bearing
10 9 reliably prevents the rotary shaft 1 from slipping off.

An upper portion of the bearing housing 7 above the stepped part 26 forms a bearing-fixing portion 32 the inside diameter of which is somewhat shorter than the outside diameter of the radial bearing 9. The radial bearing 9 is tightly inserted into the
15 bearing-fixing portion 32 of the bearing housing 7. With this, The radial bearing 9 is fixedly supported with the bearing-fixing portion 32.

Another stepped part 34 is formed at a mid-position of the cylindrical portion 21 of the bearing housing 7. With provision
20 of the stepped part 34, approximately the half of the axial length of the radial bearing 9 is held with the bearing fixing portion 32 of the bearing housing 7, which extends below the stepped part 34. A gap 33 is formed between the inner surface of the cylindrical portion 21 of the bearing housing 7 and the outer surface of the
25 radial bearing 9. The gap 33 may be formed by selecting the inside

diameter of the cylindrical portion 21 located above the stepped part 34 to be larger than outside diameter of the radial bearing 9. In an alternative formation of the gap 33, the outside diameter of the upper portion of the radial bearing 9 is selected to be larger than the inside diameter of the cylindrical portion 21 without forming the stepped part 34 on the cylindrical portion 21 of the bearing housing 7. A radial distance of the gap 33 is selected to be at least 25 μ m, for example.

The gap 33 is utilized for an oil reservoir. When the rotary shaft 1 is rotated, oil is emitted from the radial bearing 9. The oil raises from the upper end face 35 of the radial bearing 9; flows to the outer periphery side of the radial bearing 9; stays in the rotor case 3; and returns to the radial bearing 9. It is noted here that the oil does not leak out of the bearing housing 7. This fact ensures a reliability and long lifetime of the resultant motor.

As shown in Fig. 4, a base plate 6 includes burring portions 39 formed by burring and core fixing portions 38 formed by bending a part of the base plate 6 in the vicinity of the burring portion 39. The core fixing portions 38 are angularly disposed at angular intervals each of 120° while being located each between the two adjacent the burring portions 39 being arranged in a ring-like fashion. Each core fixing portions 38 is shaped to include a vertical portion located outside the related burring portions 39 and a horizontal portion horizontally extending from the vertical portion toward a space between the related adjacent burring

portions 39. The bearing housing 7 is press fit into the arrangement of the burring portions 39; the outer surface of the cylindrical portion 21 of the bearing housing 7 is firmly held with the inner surfaces of the burring portions 39. Accordingly, a verticality of the bearing housing 7 with respect to the base plate 6 is secured by the arrangement of the burring portions 39. To this end, a length of the inner surface 41 of each of the thus arranged burring portions 39 is selected so as to secure the verticality of the bearing housing 7 with respect to the base plate 6. An upper surface 55 (as a disc placing surface) of the hub 2 may be adjusted since an axial position of the bearing housing 7, viz., a press-fitting height, of the burring portions 39 may be adjusted with respect to the inner surfaces 41 of the burring portions 39. The verticality of the bearing housing 7 with respect to the arrangement of the burring portions 39 is adjusted as intended and then in this state those are coupled together by welding or bonding.

The embodiment provides a stator core fixing structure with a high rigidity for the following reason. The upper surfaces 42 of the fixing portions 38 are brought into contact with the lower surface of the stator core 5; the height of the stator core 5 is adjusted; and the cylindrical portion 21 of the bearing housing 7 holds the inner surface of the stator core 5 in a compressive manner.

Fig. 5 is a cross sectional view useful in explaining a way of assembling a bearing assembly. As shown, a jig 51 is disposed

to guide the rotary shaft 1 for its centering, and the radial bearing 9 is inserted into the jig 51. A guide bar 52 is inserted into the radial bearing 9. The thrust receiving plate 8 is put on the top of the guide bar 52; the washer 10 is placed between the thrust receiving plate 8 and the end face 28 of one end of the radial bearing 9; and in this state, the bearing housing 7 shaped like a cup is press fit to the thus assembled structure. In this case, the bearing housing 7 is moved till its bottom portion 22 comes into contact with the thrust receiving plate 8. In this state, the outer surface of the radial bearing 9 is firmly fixed with the bearing-fixing portion 32 of the bearing housing 7. In actually assembling the rotor, the guide bar 52 is pulled out of the radial bearing 9 and the rotary shaft 1 is inserted into the same instead.

Fig. 3 is a cross sectional view of the bearing housing 7, taken line a - a in Fig. 5. Axially elongated grooves 31 are formed in the inner surface of the bearing housing 7. The grooves 31 communicates a space 29, which is formed by the end face 28 of one end of the radial bearing 9 and the bottom portion 22 of the bearing housing 7, with a space 30 located closer to the opening end of the bearing housing 7. Fig. 30A shows a cross sectional view of the bearing housing 7 in which three axially elongated grooves 31a semicircular in cross section are formed in the inner surface of the bearing fixing portion 32 while being equiangularly arranged. Fig. 3B shows a cross sectional view of the bearing housing 7 in which three axially elongated grooves 31b shaped like U in cross

section are formed in the inner surface of the bearing fixing portion 32 while being equiangularly arranged.

Another bearing housing 7 is shown in Fig. 6. The bearing housing 7 includes three axially elongated grooves 31c, which are formed in the outer surface of the radial bearing 9 while being arranged equiangularly. As recalled, in each of the above two bearing housings 7, the grooves axial grooves 31a (31b) are formed in the inner surface of the bearing housing 7. The size and the number of grooves may properly be selected in accordance with a kind of motor used.

Thus, at least one groove 31 is formed in the inner surface of the bearing housing 7 or the outer surface of the radial bearing 9. The groove 31 yields the following advantages. When the rotary shaft 1 is inserted into the radial bearing 9, air present in the space 29 in the vicinity of the bottom portion 22 of the bearing housing 7 is guided outside. Further, provision of the groove 31 prevents oil from overflowing through the edge of the radial bearing 9 when the rotary shaft 1 is inserted into the radial bearing 9.

A fixing strength of the outer surface of the radial bearing 9 may be adjusted to a necessary one in a manner that a balance between the outer surface of the radial bearing 9 with the bearing fixing portion 32 of the bearing housing 7 when those are in contact with each other is varied by varying the combination of the number and the size of the of the grooves 31 as oil-leak preventing means and the axial length of the bearing fixing portion 32 of the bearing

housing 7.

Further, with provision of the grooves 31 formed in the bearing-fixing portion 32 of the bearing housing 7 or in the outer surface of the radial bearing 9, part of oil moves to the washer 10 and the extreme end of the radial bearing 9. The oil present there functions to stabilize a frictional resistance between the thrust receiving plate 8 and the rotary shaft 1 for a long time.

Fig. 7 is a side view showing a way of assembling a stator assembly, which may be used for the motor of the invention. A bearing assembly formed by inserting the radial bearing 9 into the bearing housing 7, as shown in Fig. 7A, is forcibly inserted into the center hole of the stator core 5 in a state that the opening end of the assembly is directed upward. As a result, a close contact is established between the outer surface of the bearing housing 7 and the inner surface of the center hole of the stator core 5, and the former is fixed by the latter. As already stated, the base plate 6 includes the burring portions 39 formed by burring and the core fixing portions 38 formed by bending a part of the base plate 6 at a location near the burring portion 39. After forcibly inserted and fixed by the stator core 5, the bearing assembly is press fit into the hole defined by the burring portions 39 (Fig. 7B). Then, the outer (peripheral) surface of the cylindrical portion 21 of the bearing housing 7 is firmly held by the inner surfaces 41 of the burring portions 39, and the lower surface 53 of the stator core 5 is put on the upper surfaces 42 of the core

fixing portions 38, and positioned thereat (Fig. 7C). Incidentally, bearing oil may be put, for its replenishment, into the gap 33 located between the radial bearing 9 and the bearing housing 7 after the stator assembly is assembled.

5 A height H from the upper surface 54 (as a reference surface) of the base plate 6 to the disc placing surface 55 of the hub 2 is given by

$$H = A - B \quad (1)$$

10 where A is a distance from the extreme end 24 of the rotary shaft 1 which is located closer to the thrust receiving plate 8 to the disc placing surface 55, and B is a distance from the reference surface 54 to the upper surface of the thrust receiving plate 8
15 (Figs. 1, 5, 7C and 8). The length of the rotary shaft 1, as shown in Fig. 8 determines the distance A. The distance B varies with a position of the bearing housing 7 when it is press fit into the burring portions 39 of the base plate 6 (Fig. 7C). (This position of the bearing housing 7 will be referred to a "fitting position".)
20 From this, it is seen that the height H ranging from the reference surface 54 to the disc placing surface 55 may be adjusted by the "fitting position" of the bearing housing 7. It is noted here that the burring portions 39 holds the bearing housing 7 so as to allow the bearing housing 7 to be movable in the axial and circumferential
25 directions. Therefore, adjusting the fitting position in an actual

assembling work can precisely set the height H.

As well known, to operate the thus constructed motor, electric current is fed to the drive coils in accordance with angular positions of the rotor magnet 4. Electromagnetic forces are developed between the stator core 5 and the rotor magnet 4. The rotor magnet 4, and the rotor case 3 and the hub 2, which are coupled together with the rotor magnet 4, are driven to rotate in unison.

The Fig. 1 motor described above includes the washer 10 as means for preventing the rotary shaft 1 from slipping off. Another rotor slipping-off means may be used as shown in Fig. 2. In a structure of the motor shown in Fig. 2, the rotor slipping-off preventing means 10 (Fig. 1) is not used; the bearing housing 7 does not include the stepped part 26; and the rotary shaft 1 does not include the reduced-diameter portion 27. Also in the Fig. 2 structure, a centering guide portion 40, while being protruded, is formed on the end face of the lower end of the radial bearing 9. The centering guide portion 40 is used for centering the thrust receiving plate 8.

As shown, a flange-like portion 36 is formed on the end of the bearing housing 7 at which the housing is opened. Rotor slipping-off preventing means 37 is extended from a horizontal part 3a of the rotor case 3, which is mounted on the under side of the hub 2, toward the flange-like portion 36. In a normal state of the motor, the upper surface 37a of the rotor slipping-off preventing means 37 is separated from the lower surface 36a of the flange-like

portion 36. When impact is imparted on the motor, the lower surface 36a of the flange-like portion 36 is brought into contact with the upper surface 37a of the rotor slipping-off preventing means 37, thereby preventing the rotor from slipping off.

5 The motor of Fig. 2 has the following advantages because of its technical feature not using the rotor slipping-off preventing means. If the radial bearing of the Fig. 2 motor has the axial length equal to that of the radial bearing of the Fig. 1 motor, the radial bearing 9 which is placed within the bearing housing 7 may be low
10 in height. This leads to the thinned motor structure. Further, the upper end face 35 of the radial bearing 9 may be located below the flange-like portion 36 of the bearing housing 7. This feature provides a structure making it difficult for oil to flow out of the bearing housing 7.

15 In the present invention, the drawing process is used for shaping a metal sheet into the cup-like bearing housing with the bottom portion in order to firmly hold the radial bearing 9 and the stator core 5 with the bearing housing. Use of the cup shape of the bearing housing 7 eliminates the leakage of oil that is
20 contained in the radial bearing 9 from its bottom portion. The resultant motor is high in reliability and long in lifetime. The gap 33 provided between the radial bearing 9 and the bearing housing 7 functions to prevent oil from leaking, and further may be used as a space for the replenishing of bearing oil at the time of
25 assembling the rotor into the structure.

While the present invention has been described using specific embodiments, it should be understood that the invention may variously be modified, changed and altered within the true spirits of the invention.

5 In the present invention, the bearing housing, which is shaped like a cup, includes a cylindrical portion and a bottom portion closing one end of the cylindrical portion. Therefore, in the resultant motor, no bearing oil flows outside from the bottom portion of the bearing housing.

10 Shaping a metal sheet by drawing process forms the bearing housing. Therefore, the number of parts required is reduced. The unit form of the bearing housing eliminates the leakage of bearing oil out of the housing.

15 A gap, which may be utilized for an oil reservoir, is formed between the inner surface of the cylindrical portion of the bearing housing and the outer surface of the radial bearing. Provision of the gap prevents the bearing oil from leaking out of the bearing housing, elongates a lifetime of the motor, and allows bearing oil replenishment at the time of assembling the rotor into the
20 structure.

WHAT IS CLAIMED IS:

1 1. A motor comprising:

2 a cup-like bearing housing integrally including a cylindrical
3 portion, a bottom portion and a hollow portion defined by said
4 cylindrical portion and said bottom;

5 a radial bearing held in said hollow portion while being in
6 contact with the inner surface of said cylindrical portion;

7 a thrust receiving plate disposed at said bottom portion of
8 said cup-like bearing housing; and

9 a rotary shaft rotatably supported by said radial bearing in
10 a state that an extreme end thereof is in contact with said thrust
11 receiving plate.

1 2. A motor in accordance with claim 1, wherein said bearing
2 housing is formed by shaping a metal sheet by drawing process.

1 3. A motor in accordance with claim 1, wherein said radial bearing
2 is made of sintered oil-impregnated alloy, and a gap, which may
3 be used for storing oil to be impregnated into said radial bearing,
4 is formed between the inner surface of said cylindrical portion
5 of said bearing housing and the outer surface of said radial bearing.

1 4. A motor in accordance with claim 1, wherein said bearing
2 housing has a stepped part, which is located between said bottom
3 portion thereof and an end face of one end of said radial bearing,

4 said rotary shaft includes a reduced-diameter portion, which is
5 located between an extreme end thereof closer to said thrust
6 receiving plate and an end face of one end of said radial bearing,
7 and ring-like slipping-off preventing means is placed between said
8 stepped part of said radial bearing and the end face of said radial
9 bearing, while engaging said reduced-diameter portion of said
10 rotary shaft.

1 5. A motor in accordance with claim 1, wherein a flange-like
2 portion, while bent outward, is formed on the end of said bearing
3 housing at which said bearing housing is opened, and rotor
4 slipping-off preventing means is extended from a rotor of said motor
5 toward said flange-like portion.

1 6. A motor in accordance with claim 1, wherein axially elongated
2 grooves are formed in the outer surface of said radial bearing or
3 the inner surface of said bearing housing, said grooves
4 communicating a space, which is formed by the end face of one end
5 of said radial bearing and said bottom portion of said bearing
6 housing, with another space located closer to the opening end of
7 said bearing housing.

1 7. A motor in accordance with claim 1, wherein said motor includes
2 a stator plate, said stator plate includes burring portions being
3 arranged in a ring-like fashion, and said burring portions hold

4 the outer surface of said bearing housing.

1 8. A motor in accordance with claim 7, wherein said burring
2 portions of said stator plate holds said bearing housing such that
3 said bearing housing is movable in axial or circumferential
4 directions.

1 9. A motor in accordance with claim 8, wherein said bearing
2 housing is fixedly coupled to said stator plate in a state that
3 said bearing housing is set at a predetermined position of said
4 burring portions and held by said burring portions.

1 10. A motor in accordance with claim 7, where core fixing portions
2 are formed by bending a part of said stator plate in the vicinity
3 of said burring portion, and a stator core is brought into contact
4 with said core fixing portions.

1 11. A motor comprising:
2 a rotor portion with a rotary shaft;
3 a stator portion disposed facing said rotor portion;
4 a cup-like bearing housing integrally including a cylindrical
5 portion and a bottom portion;
6 a radial bearing rotatably supporting said rotary shaft in
7 a radial directions while being held within said bearing housing;
8 and

9 a thrust bearing, disposed on said bottom portion, for
10 supporting said rotary shaft in a thrust direction.

1 12. A motor in accordance with claim 11, wherein said radial
2 bearing is a sintered oil-impregnated bearing, and said bearing
3 housing includes a bearing fixing portion for holding said radial
4 bearing having been press fit thereinto, a positioning portion for
5 positioning said radial bearing within said bearing housing, and
6 oil storing portion for storing oil to be impregnated into said
7 sintered oil-impregnated bearing.

1 13. A motor in accordance with claim 12, wherein a disc hub for
2 the attaching and detaching of a disc is attached to said rotary
3 shaft, and the directions of attaching and detaching the disc are
4 coincident with the contacting direction of said thrust bearing.

ABSTRACT OF DISCLOSURE

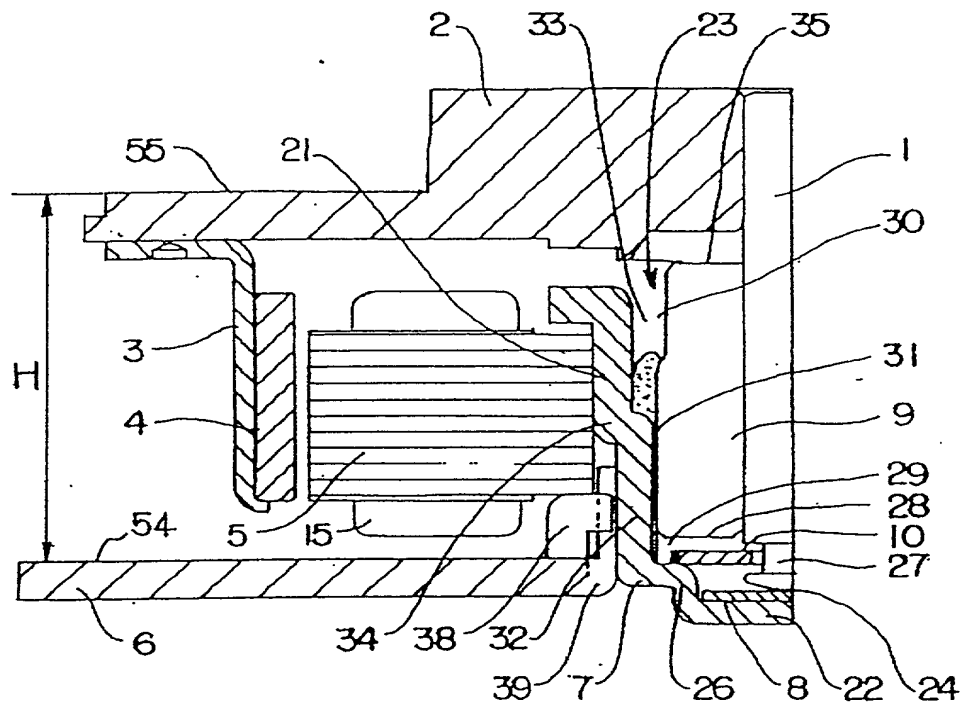
In a motor having a bearing housing 7 with a hollow portion 23, a radial bearing 9 held in the hollow portion 23, a thrust receiving plate 8 provided at one end of the hollow portion 23, and a rotary shaft 1 which is rotatably supported by the radial bearing 9 in a state that an extreme end thereof is in contact with the thrust receiving plate 8, the bearing housing 7, shaped like a cup, includes a cylindrical portion 21 and a bottom portion 22 defining one end of the cylindrical portion 21, the cylindrical portion 21 and the bottom portion 22 define the hollow portion 23, the radial bearing 9 is firmly held with the inner surface of the cylindrical portion 21, and the thrust receiving plate 8 is supported on the bottom portion 22.

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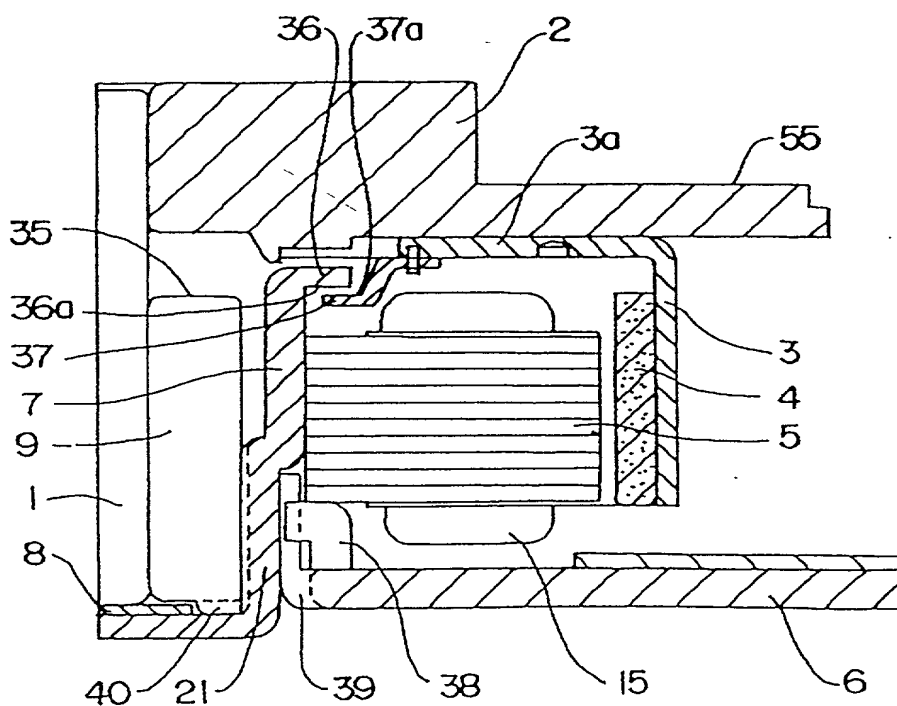
FIG. 1

【図1】



【図2】

FIG. 2



【図3】

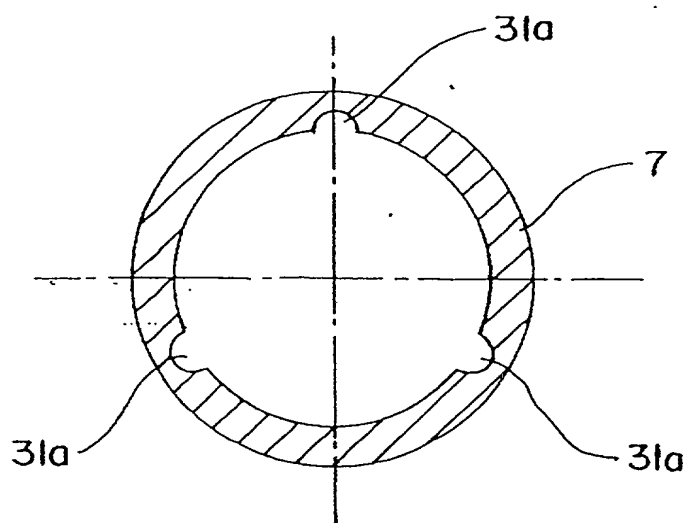


Fig. 3 (a)

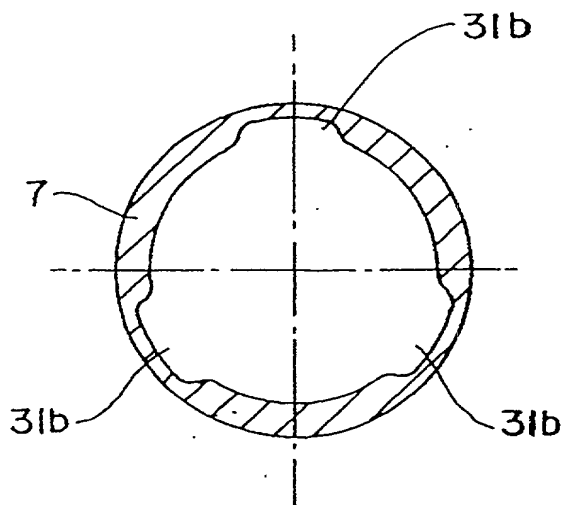


Fig. 3 (b)

FIG. 4

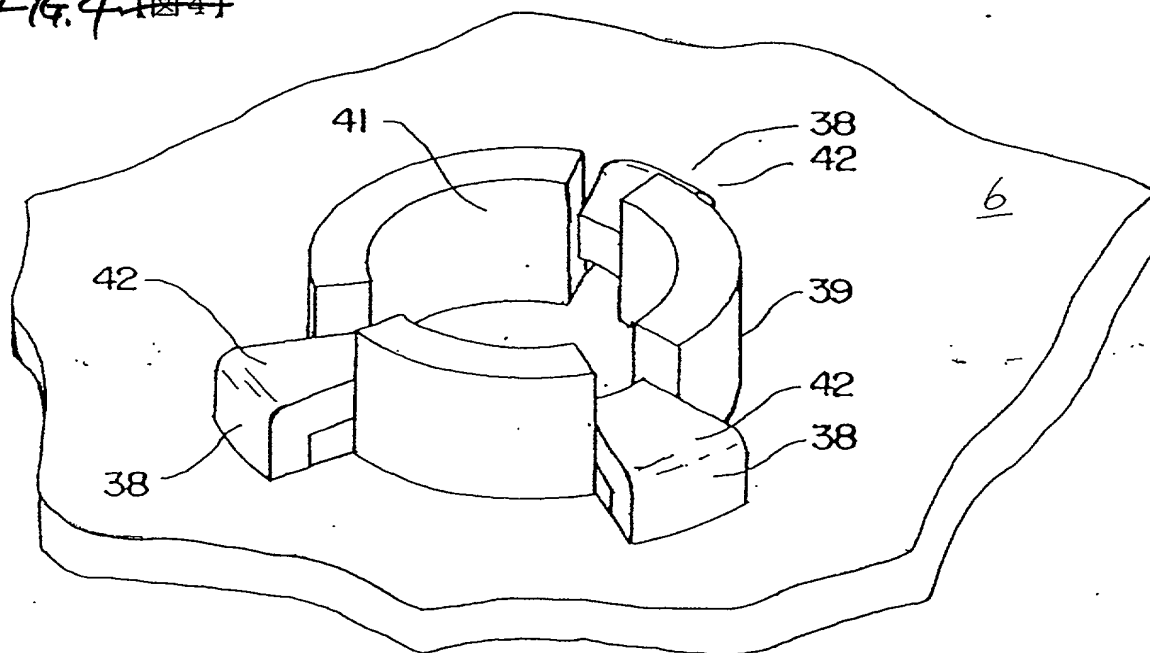
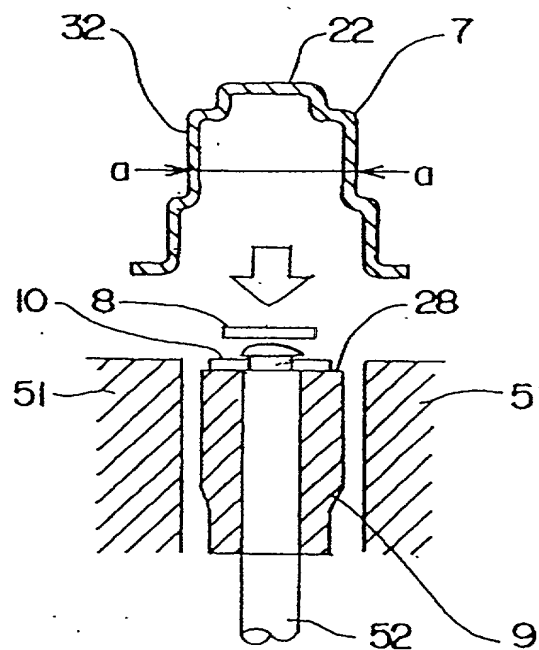


FIG. 5



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F14.6

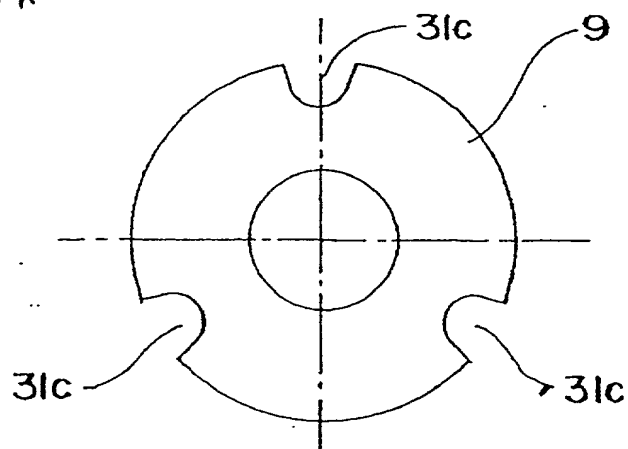


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FIG. 7(a)

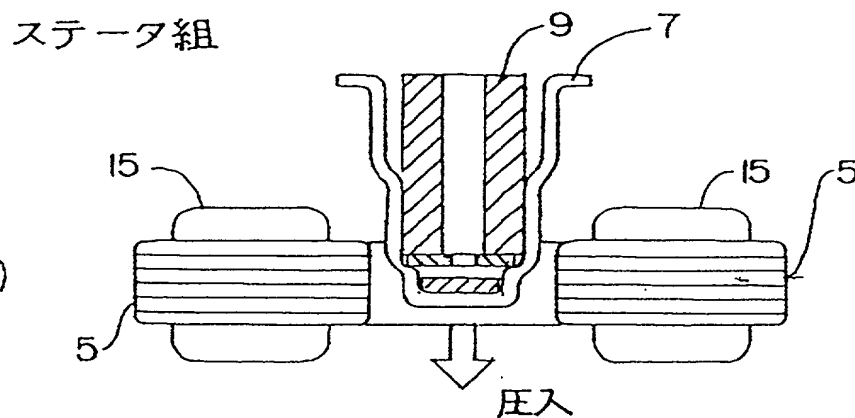


FIG. 7(b)

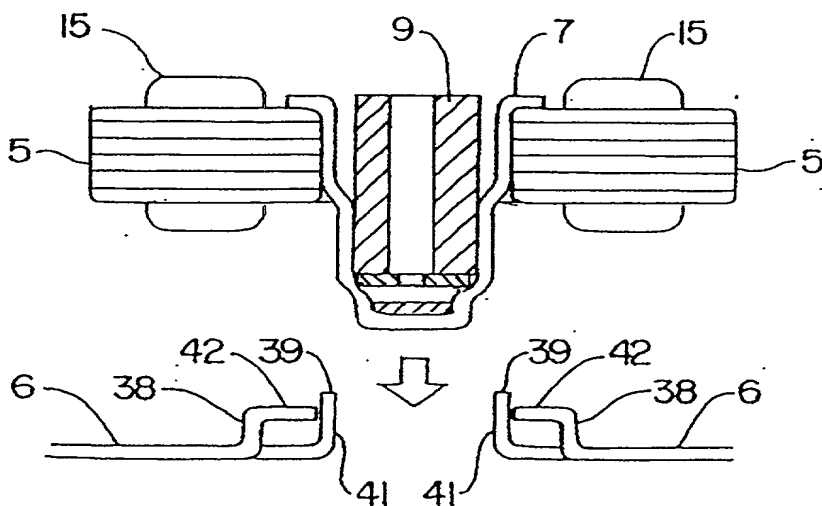
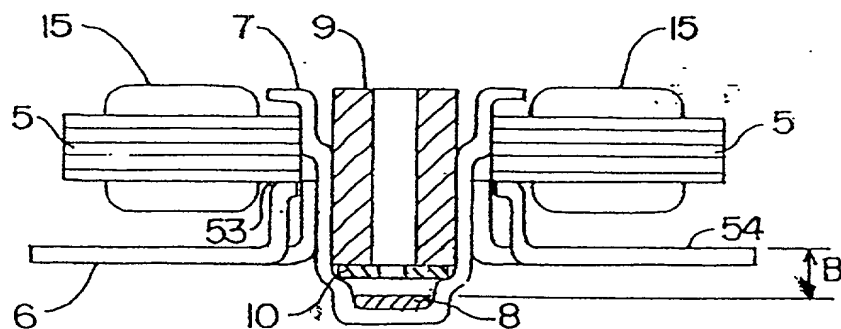
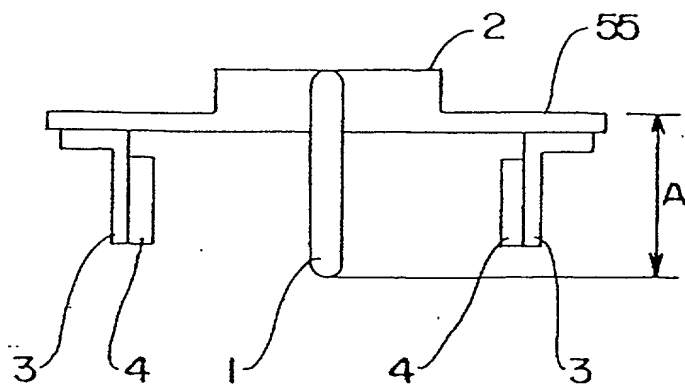


FIG. 7(c)



【図8】 FIG. 8



DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MOTOR

the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____ as United States Application Number or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information of which is material to the patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

<u>P. Hei. 10-288292</u>	<u>Japan</u>	<u>9/October/1998</u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefits under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

(Application Number)

(Filing Date)

I hereby claim the benefits under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

I hereby appoint John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; Brett S. Sylvester, Reg. No. 32,765 and Robert M. Masters, Reg. No. 35,603; my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date <u>October 1, 1999</u>	First Inventor <u>Masayuki Katagiri</u>
	First Name Last Name
Residence <u>Nagano</u>	Signature <u>Masayuki Katagiri</u>
<u>Japan</u>	Post Office Address <u>c/o KABUSHIKI KAISHA SANKYO SEIKI SEISAKUSHO,</u>
Citizenship <u>Japan</u>	<u>5329, Shimosuwa-machi, Suwa-gun, Nagano, Japan</u>

Date _____	Second Inventor _____
	First Name Last Name
Residence _____	Signature _____
	Post Office Address _____
Citizenship _____	